



A REPORT ON MAIZE CULTIVATION AT COASTAL-SALINE ZONE

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ABSTRACT

Maize (Zea mays) is regarded as Third most important food crops in India after rice, wheat. It's also given the title of "Queen of Cereals" due to its the highest yield potential (Production: - 11.5 M Tonnes and Productivity: - 3000 kg/ha in India) as well as having the wider adaptability under varied agro-climatic conditions. Currently, nearly 1147.7 million MT of maize is being produced together by over 170 countries from an area of 193.7 million ha with average productivity of 5.75 t/ha (FAOSTAT, 2023). Among the Maize growing countries, India ranks 4th in Area and 7th in Production status. Being a wider adaptable to every climatic Condition, we had decided to grow the maize in Coastal saline zone. In the campus of THE NEOTIA UNIVERSITY, Jhinga, Sarisa, Diamond Harbour, South 24 Pgs, West Bengal, we had grown the hybrid variety of Maize "YUVRAJ GOLD" to examine the difference between every crop ecological aspect. This region is well known for Alkaline or saline soil as well as a very hot & humid climatic condition during summer and dry and cold condition during winter. Average yearly rainfall occurred 1686.3 inches in this area mainly during the summer. Here we had cultivated the Maize during Rabi season on 2nd fortnight of November. We had tried to identify crop's growth status, Infestation of insect-pests and Diseases, Crop Yield; various post-harvest measures (e.g. Cob Length, Diameter, no. of cobs per plant, no. of grains per cob, Harvest Index etc.). We had followed generalized agronomical practices to grow this crop for identifying the discriminations shown by the crop in that Particular region. This article has intended to show the whole agronomical practices as well as crop Protection strategies to represent any significant difference in crop yield status.

Keywords: Maize, Agronomical intervention, Plant Protection, Yield, Data.

INTRODUCTION

Maize (*Zea mays* L) is one of the most versatile emerging crops among all the cereals, that having wider diversity of soil, climate, biodiversity and management practices that contributes 36 % (782 m t) in the global grain production. In Indian Scenario Maize can be cultivated in both

season but we had chosen the Rabi season for sowing the crop.

Botanical Description

- **Scientific Name:** *Zea mays*
- **Family-** Graminae (Poaceae)
- **Chromosome No.-** 2n (20)

The centre of origin of Maize is considered as **Central America** or **Southern Mexico**.

Maize is considered a most important food grain and industrial crop of the world as well as contains carbohydrate (70%), protein (10%), fat (5-7%), minerals (2%), fibre (3-5%). Maize protein is specifically known as ‘**Zein**’ mainly deficient in **Tryptophan & Lysine** amino acids. Being a Monoecious crop, Maize is being pollinated by Anemophily.

The research was conducted at Instructional Farm of The Neotia University (TNU), Sarisha, Diamond Harbour, West Bengal, India, located at 22°48' N latitude and 88°31' E longitudes with an average altitude of 8 m above the mean sea level (MSL). The Soil pH values varied within and between these blocks, ranging from 6.46 to 7.89 which refers the neutral to slightly alkaline soil. The Average Organic carbon quantity also fall into low to medium quantity (0.41 to 0.59 %) The available N content of the soil is around 339.04 kg/ha which signifies the handsome amount Soil N content. Available Phosphorous and Potassium content are respectively 54.98 kg/ha and 312.27 kg/ha can be assigned a high level of nutrient index. By examining the physico-chemical characteristics and nutrient status of coastal soil of Instructional farm of The Neotia University revealed that the soil was neutral in soil reaction and saline. While organic carbon and available nitrogen content were medium, available phosphorus and potassium status were high. All experiments and estimations had done on Soil Science laboratory of The Neotia University.

We had taken the Hybrid variety of Maize “**YUVRAJ GOLD**” (Truthfully labelled Seed) used to grow mainly Southern and Western Part of India along with the North-

eastern part of India including West Bengal.

Seed Contains the Label of Purities

1) Physical Purity	98%
2) Genetic Purity	95%
3) Germination	90%
4) Inert Matter	2%
5) Other crop Seeds (max)	10/kg
6) Moisture (max)	12%

PROCEDURE OR METHODOLOGIES

1. Field Preparation

First of all, on 18th November, 2021, we were preparing our fallow plot for cultivation of maize. We had done manual weeding on plot at first and done the primary tillage with the help of spade at one time.

On the next day, 19/11/2021, we had again ploughed the field with spades to break the clods of upper layer of soil and made it well-distributed for healthy germination.

On 21/11/2021, we had prepared the bunds of almost 3-5 cm height and bounded the total **18m²** area in a definite manner within the bund along the four edges of plot. On that day, we had also done labelling of our plot with a help of a piece of wooden block.

2. Seed Sowing

On the next day, 23rd November, 2021 we had sown one Hybrid variety of Maize “**YUVRAJ GOLD**” seeds having **98% physical purity** and **95% Genetic purity**. This good quality seeds having **90% germination percentages** and chemically treated with **THIRAM @ 3g/kg** of seeds. Before Sowing, again we had performed the microbial inoculation with one packet of **Azotobacter (200gm.)** to enhance the

germination ability and vigour crop growth. After that we made 6 furrows and sown **114 seeds (38 gm.)** in total **18m²** land. Total 19 seeds were sown in each row.

- **Spacing between row to row was- 45 cm and spacing between plant to plant in each furrow - 30cm (45×30cm²)**
- **Depth of Sowing was maintained- 4cm not more than 5 cm.**
- **Method of Sowing- Line sowing manually by hand.**
- **Total plant population: - 120/18m²**



Sowing of Seeds



Microbial inoculation of Seeds

3. Basal Application of Fertilizer & First Irrigation

For Hybrid variety of Maize, mainly the recommended NPK requirement is 120:60:40 kg/ha, which should be applied

in three split dosages- 1/3rd of Nitrogenous fertilizer and full P & K application should be done as basal, and remaining 1/3rd of N should be given at first 25 DAS & another or last 1/3rd split application of N on 50 DAS.

For **18m²** land, we had calculated the optimum basal dose of inorganic NPK requirement was **156 gm Urea, 120 gm MOP** and **675 gm SSP** for fulfilling the optimum demand of crop. After giving the mentioned amount of basal dose of fertilizers and just after sowing, we immediately irrigated the land along the furrows with a bucket and mug.

✓ **Method of Application:** Manually broadcasted the fertilizers.

4. Irrigation Management

In case of Maize water requirement isn't so much high, only **400-600 mm** and the most critical stages of irrigation is **tasseling and silking stage**. We had given the irrigation on 5-10 days interval but just after sowing due to scorching sun rays frequent water application was performed.

Irrigation Scheduled & Method of application

- **Just after Sowing**
 - ✓ 23/11/2021 (5 buckets of water)
 - ✓ 26/11/2021 (3 buckets of water)
 - ✓ 30/11/2021 (4 buckets of water)
 - ✓ 02/12/2022 (5 buckets of water)
- **At Vegetative Stage (After germination)**
 - ✓ 15/12/2022 (4 buckets of water)
 - ✓ 18/12/2022 (Sprinkle irrigation through pipe)
 - ✓ 20/12/2022 (Sprinkle irrigation through pipe)
 - ✓ 25/12/2022 (Sprinkle irrigation through pipe)
 - ✓ 05/01/2022 (Sprinkle irrigation through pipe)

- ✓ 10/01/2022 (Ridge-Furrow constructed and the Ridge-furrow irrigation was given)
- ✓ 16/01/2022 (Ridge-furrow irrigation)
- ✓ 18/01/2022 (Ridge-furrow irrigation)
- ✓ 24/01/2022 (Ridge-furrow irrigation)
- ✓ 10/02/2022 (Ridge-furrow irrigation)
- **At Ripening (Tasselling-Silking Stage)**
- ✓ 2/03/2022 (Ridge-furrow irrigation)
- ✓ 9/03/2022(Ridge-furrow irrigation)
- ✓ 15/03/2022 (Ridge-furrow irrigation)

5. Nutritional Management

After giving the Basal application of fertilizers, again we had performed top dressing of rest 1/3rd amount of N through applying of **156 gm. of Urea** on 18th January, 2022 (57 DAS) and the second and last split application of N fertilizer was given at 10th February, 2022 by applying same amount **156 gm. of Urea** (77 DAS). Just after application of split dosages, we had done the sprinkle irrigation to get mobilize the nutrients in crop root zone.

- ✓ **Method of Application:** At 1st Top-dressing, manually broadcasted the fertilizers. At 2nd Top-dressing, Band application of fertilizers near the crop root zone only.

6. Weed Management

In our plot, all categorized weeds can be found, like:

- **Grasses:** *Cynodon dactylon*,
Echinochloa spp.
- **Sedges:** *Cyperus spp.*
- **Broad-Leaved:** *Euphorbia microphylla*
- **Control Measures:** To control the critical crop-weed competition, we had performed two manual hand weeding, 1st on 11/01/2022 and second-hand

weeding done on 25th January, 2022, at 30cm plant height.



Euphorbia microphylla



Echinochloa spp.



Cyperus rotundus

7. Intercultural Operations

To keep the crop standing more vigorous & healthier, we performed thinning of unwanted crop as well as gap filling to keep the plant population optimum in our plot on

18th January, 2022, at the 15cm plant height.

As well as the construction of Ridge-Furrow along the line of plant also facilitate to keep crop in standing position and effective water mobilization. We had prepared the ridge-furrow on 10th February, 2022, after attaining the plant height at least 30.5 cm.



Gap Filling and Thinning



Computation of Plant Height

8. Insect-Pest Management

In our plot, mainly the infestation of Fall Armyworm (FAW) [*Spodoptera frugiperda*] and Rugose spiralling whitefly [*Aleurodicus rugiperculatus*] could be

found at the time of vegetative stage as well as tasseling stage.

- **Nature of Damage:** In vegetative stage, they mainly cut the leaf & make hole in horizontal pattern and the leaves fall down from that part. Young larva leaving silvery transparent membrane and making hole inside the main axis of stem and feeds the developing tassel and hampers the flowering.
- Rugose spiralling whitefly mainly transmits one viral disease **Maize white chlorotic symptom**.
- **Control Measures:** we had sprayed the systemic & contact insecticide **HAMLA 550 (Chlorpyrifos 50%+ Cypermethrin 5% EC) @ 3g/l** in each 18m² plot with the help of **Knapsack sprayer** to get rid of from FAW as well as whitefly on 15th February, 2022.



FAW Attack and Its nature of symptom





Spiralling White fly

9. Disease-Pest Management

Maize becomes infected with several fungal & bacterial stalk rot in field condition. In our plot, we had experienced the tremendous infection of Maize charcoal stalk rot [*Macrophomina phaseolina*] & *Fusarium* stalk rot.

- **Symptom:** Most of the plants become completely wilted as because the vascular portion of stem clogged by fungal mycelium and the roots are totally spoiled. Several tiny purplish spots become visible on the stem near the soil level, wilted whole plant bend & breaks from the upper soil level, cob production and yield were severely hampered.
- **Control Measures:** We had applied Contact copper Fungicide **BLITOX (COPPER OXYCHLORIDE 50% WP)** only on the stem region for quick controlling of stalk rot @ **3g/l** water with the help of **Knapsack sprayer** on 25th February, 2022.



Fusarium Stalk Rot



White Chlorotic

10. Harvesting of Crop

Basically, the Hybrid Maize variety should be harvested within 90- 110 days. Maize should be harvested when the husk covering the corn turns pale brown and grains are too hard to be pressed with finger nail as well as Cobs must be at 20% grain moisture.

We had harvested our plot on 28th March, 2022, manually just by picking up the cobs. After that, by keeping crops in field for some days, we had finally done harvesting process on 5th April, by cutting all the crops through a sharp-edged Sickle. Then we collected datas of five well-developed and matured cobs.

- ✓ **Method of Harvesting:** Simply picking up the cobs by manually and then cutting the crop stubbles through a sharp-edged Sickle.
- ✓ **Duration from sowing to Harvesting:** 125 days
- ✓ **Harvested Cobs:** 40 cobs
- ✓ **Total Cob Weight:** 3.5 kg. /18 m²
- ✓ **Total Straw Weight:** 5 kg.

11. Yield of Crop

From 18 sq.m. maize plot, we can get hardly 3.5 kg yield or 40 cobs.

- ✓ **Harvested Cob- 40**

- ✓ **No. of Cobs/plant- 1**
- ✓ **No. of cobs/ plot- 30**
- ✓ **Yield (Total cob weight): 3.5 kg**
- ✓ **Total Grain Yield: 2125 gm**



12. Drying of Cobs

Just after Harvesting, we kept the cobs in our field for sun-drying from on 6th April- 10th April, 2022 for keeping down the moisture that considers safe for grain storage.

13. Shelling

Shelling can be done either manually or by using maize shellers operated by hand or power. We had kept the harvested cobs for 4 days by removing its husks, and then we had performed the shelling process on 11th April, 2022, by manually.

Results (Datasheet of Harvested Cobs)

Cob	Length	Diameter	No. of Rows/Cob	No. of Grains/ Row	No. of Grains/ Cob
Cob-1	27 cm	Upper Diameter- 10 cm Middle Dia- 16 cm Base Dia- 13 cm Average Dia- 13 cm	14 rows	Row-1: 22 grains	313 grains
				Row-2: 22 grains	
				Row-3: 21 grains	
				Row-4: 22 grains	
				Row-5: 25 grains	
				Row-6: 24 grains	
				Row-7: 23 grains	
				Row-8: 22 grains	
				Row-9: 20 grains	
				Row-10: 22 grains	
				Row-11: 23 grains	
				Row-12: 20 grains	

				Row-13: 25 grains Row-14: 22 grains Average Grains- 22.36 Row-1: 33 grains Row-2: 32 grains Row-3: 34 grains Row-4: 33 grains Row-5: 35 grains Row-6: 34 grains Row-7: 32 grains Row-8: 30 grains Row-9: 34 grains Row-10: 35 grains Row-11: 31 grains Row-12: 33 grains Average Grains- 33 Row-1: 26 grains Row-2: 26 grains Row-3: 27 grains Row-4: 23 grains Row-5: 22 grains Row-6: 21 grains Row-7: 25 grains Row-8: 27 grains Row-9: 22 grains Row-10: 21 grains Row-11: 27 grains Row-12: 26 grains Average Grains- 24.41 Row-1: 18 grains Row-2: 16 grains Row-3: 18 grains Row-4: 20 grains Row-5: 14 grains Row-6: 13 rows Row-7: 17 rows Row-8: 12 rows Row-9: 14 rows Row-10: 13 rows Row-11: 12 rows Row-12: 16 rows Row-13: 17 rows Row-14: 12 rows Row-15: 13 rows Row-16: 14 rows Average Grains: - 14.93 Row-1: 21 rows Row-2: 21 rows Row-3: 22 rows Row-4: 23 grains Row-5: 22 grains	
Cob-2	22 cm	Upper Dia- 11 cm Middle Dia- 13.9 cm Base Dia- 14 cm Average Dia- 13 cm	12 Rows		396 grains
Cob-3	27.3 cm	Upper Dia- 7cm Middle Dia- 15.2 cm Base Dia- 15 cm Average Dia- 12 cm	12 Rows		293 Grains
Cob-4	25 Cm	Upper Dia- 8.4 cm Middle Dia- 14.4 cm Base Dia- 10 cm Average Dia- 11 cm	16 Rows		239 Grains
		Upper Dia- 9 cm			

Cob-5	29 cm	Middle Dia- 15 cm	14 Rows	Row-6: 24 grains	307 Grains
		Base Dia- 12 cm		Row-7: 24 grains	
		Average Dia- 12 cm		Row-8: 23 grains	
		Row-9: 21 grains			
		Row-10: 21 grains			
		Row-11: 20 grains			
		Row-12: 23 grains			
		Row-13: 20 grains			
		Row-14: 22 grains			
		Average Grains:-			
		21.92			

$$\text{Harvest Index} = \frac{\text{Economic yield (Grain yield)}}{\text{Biological yield (Grain yield + Straw yield)}} \times 100$$

$$= \frac{2125 \text{ gm.}}{2125+6000} \times 100$$

$$= 26.15 \%$$

COMPUTATION OF PLANT HEIGHT

Plant Height on 25th January, 2022 (65 DAS)

Row No.	Plant No.	Plant Height
2 nd	2 nd	73.5 cm
5 th	3 rd	25 cm
3 rd	7 th	39 cm
6 th	7 th	14 cm
1 st	11 th	36 cm
3 rd	15 th	17 cm
5 th	15 th	41 cm
6 th	16 th	5.5 cm
4 th	11 th	44 cm
3 rd	17 th	9 cm

Average Plant Height: - 30.4 cm

Plant Height on 28th March, 2022 (125 DAS, at the time of harvesting)

Row No.	Plant No.	Plant Height	Stem Girth
2 nd	2 nd	140 cm	7 cm
1 th	2 nd	153 cm	7.5 cm
3 rd	2 nd	177 cm	6.3 cm
4 th	6 th	176 cm	6.5 cm
5 th	1 st	202 cm	8.1 cm
6 th	1 st	112 cm	5.3 cm
6 th	5 th	107 cm	5 cm
5 th	15 th	141 cm	6.7 cm
3 rd	16 th	77 cm	5.1 cm
1 st	11 th	108 cm	5.9 cm

Average Plant Height: - 139.3 cm

Calendar of Operation Followed

DATE	NAME OF THE OPERATION FOLLOWED
18 th November, 2021	Primary tillage had followed in plot to prepare the fallow land for maize
19 th November, 2021	Secondary tillage had followed to break the clods of upper layer of soil
21 st November, 2021	Preparation of bunds of almost 3-5 cm height and levelling of land.
23 rd November, 2021	Seed Sowing was done in plot 114 seeds (38 gm.)
23 rd November, 2021	Basal Application of Fertilizer was applied.
23 rd November, 2021	First Irrigation after sowing was performed (5 buckets of water)
11 th January, 2022	First Manual weeding had done and Sprinkle irrigation was given.
18 th January, 2022	Intercultural operations Thinning & Gap filling was performed by manually.
18 th January, 2022	1 st Top dressing of Urea (156 gm) was given.
18 th February, 2022	Sprinkle application of Irrigation was done.
25 th January, 2022	2 nd Manually hand weeding had performed and Computation of plant height Was taken.
10 th February, 2022	2 nd Top dressing of N applied through Urea application.
10 th February, 2022	Construction of Ridge-Furrow was done and application of ridge-furrow Irrigation.
15 ^h February, 2022	Spraying of systemic & contact insecticide HAMLA 550 @ 3g/l to get rid Off from the FAW and White fly.
25 th February, 2022	Contact copper Fungicide BLITOX (COPPER OXYCHLORIDE 50% WP) only on the stem region for quick controlling of stalk rot @ 3g/l
28 th March, 2022	Computation of Plant height was done for 2 nd time.
28 th March, 2022	Harvesting of Crop was performed, simply manually picking the cobs.
6 th April-10 th Apr, 2022	Drying of the Cobs in an open field.
5 th April, 2022	Simply cutting the crops from above soil surface manually with a sickle.

CONCLUSION

Being a most important & cultivated cereal crops, Maize having the world-wide importance, imparting 49% human consumption, 12% poultry or cattle feed and about 25% of maize taken as industrial raw materials. By Conducting this research project, we can able to understand the optimum yield of Hybrid maize can't be attained here as well as certain limitations of soil and agronomical practices also cause reduction in yield. Due to low to

medium nutrient index of Nitrogen Phosphorous of soil, to replenish those requirements, proper amount of organic matter, green manures, and inorganic fertilizers should be applied. For better yield and cob characteristics we must follow the prescribed agronomical practices, plant protection measures and crop ecological factors efficiently.

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